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REMARKS/ARGUMENTS

Following entry of the present amendment, claims 1, 2, 5-10 12-23, and 42-50 remain in the application for consideration. Claim 1 is herein amended. Claims 3, 4, 11, and 24-41 are cancelled without prejudice. New claims 42-50 are herein added.

Claim Objections and Allowable Subject Matter

The Examiner indicated that claims 5, 10 and 19-22 were objected to, but would be allowable if rewritten in independent form.

Applicants herein amend claim 1 to add the limitation that the antitarnish layer has a thickness of less than 1000 Angstroms. Applicants submit that this limitation is not taught or suggested by any of the art of record, and that now claims 1-2, 5-10, and 12 are allowable.

Applicants further present new claims 42-50. Applicants submit that claim 42 recites a barrier layer disposed between the second surface and the substrate, and that the barrier layer comprises nickel, tin, iron, cobalt, copper, manganese, and combinations thereof, in accordance with the Examiner' suggestions. Applicants now submit that claims 42-50 are also allowable.

The Invention:

The present invention is directed to coated substrate that includes an antitarnish component. In one embodiment, the invention is directed to a coated substrate, comprising an antitarnish layer deposited on a substrate, and an outer layer comprising tin or tin alloy deposited onto the antitarnish layer, as disclosed and particularly claimed in claims 1-12. According to the invention, the antitarnish layer positioned between the substrate and the outer layer results in significantly reduced tarnishing of the outer layer.

In a second embodiment, the present invention is directed to a substrate coated with a metal layer, wherein the metal layer includes a nonzero concentration gradient of antitarnish agent whereby the greatest concentration of antitarnish agent is located adjacent to the substrate and the least amount of antitarnish agent is located at the top of the metal layer, as disclosed and claimed in claims 13-23. In this embodiment, a heating step (termed "reflow") is performed on the coated substrate in order to melt the outer layer and allow it to diffuse into the antitarnish layer, thus establishing a concentration gradient of antitarnish agent diffused through the outer layer.

Rejections under 35 USC §102:

Claims 1-4, 6-9, 12-18, and 23 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 6,403,234 to Kodama et al. Applicants respectfully traverse the rejection.

As amended, claim 1 of the present invention recites a coated substrate, comprising an antitarnish layer deposited on a substrate; and an outer layer deposited onto the antitarnish layer, the outer layer comprising tin or tin alloys having at least 50% by weight tin, and wherein the antitarnish layer is present in an amount effective to prevent tarnishing of the outer layer and wherein the antitarnish layer has a thickness of less than 1000 Angstroms.

Claim 13 recites a coated substrate comprising a coating on a substrate, the coating having a first surface and a second surface, the second surface positioned adjacent to the substrate, and comprising a metal layer comprising tin or tin alloys having at least 50% by weight tin; and a nonzero concentration gradient of antitarnish agent diffused into the metal layer, the nonzero concentration gradient having the highest concentration of the antitarnish agent at the second surface, the antitarnish agent present in the coating in an amount effective to prevent tarnishing of the metal layer; and wherein the coating has a thickness between 10 microinches and 1000 microinches.

Kodama et al. disclose a substrate coated with an intermediate layer of phosphorous, boron, zinc, and copper, and a tin or tin alloy top coating. Kodama et al. disclose that the intermediate layer is preferably between 0.3 μm (3000 Å) and 1.0 μm (10,000 Å). Example 21 of Kodama et al. shows the intermediate layer being 0.1 μm (1000 Å).

With regard to pending claims 1-4, 6-9 and 12, Applicants submit that Kodama et al do not disclose or suggest that the zinc coating may be used as an antitarnish layer, much less the advantages of having an antitarnish layer applied to the substrate. Kodama et al. also do not disclose or suggest that the proper amount of zinc is an amount effective to prevent tarnishing of the outer layer. Significantly, Kodama et al. disclose a minimum thickness of the intermediate layer being 1000 Å. However, there is no teaching or suggestion to implement thicknesses that are less than 1000 Å. In contrast, claim 1 now explicitly recites thicknesses of the antitarnish layer being less than 1000 Å.

With respect to claims 13-18 and 23, Applicants submit that Kodama et al. do not disclose or suggest any type of gradient of materials, or a layer having a gradient with specific thicknesses. Accordingly, Applicants submit that the claimed invention is distinguishable from Kodama et al., and that this rejection is overcome.

Claims 13 and 15-18 were rejected under 35 USC §102(b) as being anticipated by Japanese Patent Publication No. 09-291394 issued to Yoshiaki et al. Applicants respectfully traverse the rejection.

Yoshiaki et al. disclose an aluminum base material coated with tin or a tin alloy, wherein a concentration gradient of tin or tin alloy such that the concentration of tin is least towards the direction of the base material.

In contrast, Claim 13 of the present invention recites a coated substrate comprising a coating on a substrate, said coating having a first surface and a second surface, said second surface positioned adjacent to said substrate, and comprising a metal layer comprising tin or tin alloys having at least 50% by weight tin; and a nonzero concentration gradient of antitarnish agent diffused into said metal layer, said nonzero concentration gradient having the highest concentration of said antitarnish agent at said second surface, said antitarnish agent present in said coating in an amount effective to prevent tarnishing of said metal layer; and wherein said coating has a thickness between 10 microinches and 1000 microinches.

Applicants submit that Yoshiaki et al. does not anticipate the presently claimed invention. Yoshiaki et al. does not disclose an antitarnish layer positioned between the substrate and the tin layer (e.g., three materials). On the contrary,

Yoshiaki et al. discloses only two materials in the disclosed laminate. Further, with respect to the concentration gradients, Yoshiaki et al. discloses that the least amount of tin is present at the interface of the base aluminum material. In sharp contrast, the present invention claims the greatest amount of antitarnish agent at the substrate interface. Based on these distinctions, Applicants submit that Yoshiaki et al. does not anticipate the presently claimed invention, and that this rejection is overcome.

Rejections under 35 USC §103

Claim 8 was rejected under 35 USC §103 as being unpatentable over Kodama et al. Applicants submit that for the reasons stated above, Kodama et al. does not make the present invention obvious, and that this rejection is overcome.

Applicants now submit that the claims are in condition for allowance, and respectfully request reconsideration and issuance of a timely Notice of Allowance.

If the Examiner has any questions or feels that a discussion with Applicants' representative would expedite prosecution, the Examiner is invited and encouraged to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,

CHRISTOPHER P. LAURELLO ET AL.

By Todd E. Garabedian

Todd E. Garabedian, Ph.D.
Registration No. 39,197
Attorney for Applicants

WIGGIN & DANA
One Century Tower
New Haven, CT 06508

Telephone: (203) 498-4400
Fax: (203) 782-2889

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